

VIDEO PLAYLIST: parkermaths.com/y2diff

STANDARD RESULTS ► KEY FACTS

$$\frac{d}{dx} \sin x = \cos x$$

$$\frac{d}{dx} \cos x = -\sin x$$

$$\frac{d}{dx} \tan x = \sec^2 x$$

$$\frac{d}{dx} \ln x = \frac{1}{x}$$

STANDARD RESULTS ► PRACTICE PROBLEMS

Q1 $f(x) = 3\sin x + \frac{1}{2}\cos x - 5\tan x$. Find $f'(x)$.

Q2 $y = 2e^x - 4\ln x + \frac{2}{3}\cos x + 6x^{\frac{5}{3}}$. Find $\frac{dy}{dx}$.

Q3 $\frac{d}{dx} \left(\frac{\tan x}{3} + 4e^{2x} - 3x^{-\frac{1}{2}} + \frac{1}{2}\ln x \right)$

Q4 $y = 2\ln x - 5\cos x + 3\sin x - x^{\frac{1}{4}}$. Find $\frac{d^2y}{dx^2}$.

THE CHAIN RULE | KEY FACTS

- The chain rule is used to differentiate composite functions.
 - i.e. functions within functions
- We need to know how to differentiate both the inner and outer function separately.
- For simple cases, you should aim to be able to do the chain rule in your head.

THE CHAIN RULE

If $y = f(u)$, where $u = g(x)$, then

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

THE CHAIN RULE | EXAMPLE PROBLEM PAIRS

1E. $y = (2x - 5)^6$. Find $\frac{dy}{dx}$.

1P(a). $y = (3x + 1)^5$. Find $\frac{dy}{dx}$.

1P(b). $y = \left(\frac{1}{3}x + 1 \right)^4$. Find $\frac{dy}{dx}$.

2E. $y = 4(2x^2 - 3x + 7)^3$. Find $\frac{dy}{dx}$.

2P(a). $y = 3(5x^2 + 2x + 3)^5$. Find $\frac{dy}{dx}$.

2P(b). $y = \frac{2}{7} \left(x^4 + \frac{1}{3}x^2 \right)^4$. Find $\frac{dy}{dx}$.

3E. $y = \sqrt{3x+1}$. Find $\frac{dy}{dx}$.

3P (a). $y = \sqrt[3]{5x-6}$. Find $\frac{dy}{dx}$.

3P (b). $\frac{d}{dx} \frac{3}{\sqrt{4x+9}}$. Find $\frac{dy}{dx}$.

4E. $y = 3e^{5x} + 7$. Find $\frac{dy}{dx}$.

4P (a). $y = 2e^{3x-2}$. Find $\frac{dy}{dx}$.

4P (b). $y = 2e^{8-3x^2}$. Find $\frac{dy}{dx}$.

5E. $y = 6 \cos 5x$. Find $\frac{dy}{dx}$.

5P (a). $y = 2 \sin 6x$. Find $\frac{dy}{dx}$.

5P (b). $y = \frac{2}{3} \tan\left(\frac{1}{4}x\right)$. Find $\frac{dy}{dx}$.

6E. $y = \ln(3x+5)$. Find $\frac{dy}{dx}$.

6P (a). $y = \ln(2x-7)$. Find $\frac{dy}{dx}$.

6P (b). $y = 2 \ln(3x^2 + 8x)$. Find $\frac{dy}{dx}$.